

**WHAT IS CLAIMED IS:**

1. A method of calibrating a flowmeter comprising:

determining a plurality of calibration values, the calibration values corresponding to measurements of material in a flowtube, the flowtube being associated with the flowmeter;

associating each of the calibration values with one of a plurality of operational parameters of the flowmeter, each of the operational parameters being present during the determining of its corresponding calibration value; and

storing the calibration values in association with their respective operational parameters.

2. The method of claim 1 wherein determining the plurality of calibration values comprises determining a plurality of zero-flow calibration values corresponding to the measurements, where the measurements include mass flow measurements erroneously indicated by the flowmeter during a time of substantially zero mass flow through the flowtube.

3. The method of claim 1 further comprising:

determining a current operational parameter of the flowmeter; and

determining a current calibration value for use during an obtaining of a mass flow measurement, based on the current operational parameter.

4. The method of claim 3 wherein determining the current operational parameter comprises determining a density of the material in the flowtube.

5. The method of claim 4 wherein determining the current calibration value of the flowmeter comprises measuring a current density of a current material in the flowtube.

6. The method of claim 4 wherein associating each of the calibration values with one of the plurality of operational parameters comprises associating a first calibration value with a range of densities.

7. The method of claim 6 wherein determining the current calibration value comprises:

measuring a current density of a current material in the flowtube;  
determining that the current density falls within the range of densities; and  
5 selecting the first calibration value.

8. The method of claim 4 wherein associating each of the calibration values with one of the plurality of operational parameters comprises using a mathematical relationship between the calibration values and the plurality of operational parameters.

9. The method of claim 8 wherein determining the current calibration value comprises:

measuring a current density of a current material in the flowtube;  
using the current density in conjunction with the mathematical relationship to  
15 determine a current calibration value; and  
selecting the current calibration value.

10. The method of claim 3 wherein determining the current operational parameter comprises determining a configuration of flow elements associated with the flowtube.

11. The method of claim 10 wherein determining the current calibration value comprises accepting an input from a user, the input identifying a current configuration of flow elements.

12. The method of claim 10 wherein determining the current calibration value comprises:

measuring a first density of a first material in the flowtube;  
accessing a correlation between the first density and a first configuration of flow  
elements; and  
30 selecting a first calibration value corresponding to the first configuration.

13. The method of claim 3 wherein determining the current operational parameter comprises determining a gas void fraction of the material in the flowtube.

14. The method of claim 13 wherein determining the current calibration value  
5 comprises:

receiving an input of the gas void fraction from a gas void fraction measurement system; and

selecting the current calibration value from a pre-determined list of associated calibration values and gas void fractions.

15. A calibration system comprising:  
a measurement system operable to output measurements of material in a flowtube,  
where the flowtube is associated with a flowmeter;

a calibration system operable to determine calibration values, each based on a  
15 corresponding measurement output by the measurement system; and

a memory operable to store each of the calibration values in conjunction with an operational parameter associated with an operation of the flowmeter at a time of the corresponding measurement.

16. The system of claim 15 wherein the calibration system is operable to select a calibration value from the memory, based on a current operational parameter associated with the flowmeter.

17. The system of claim 15 wherein the measurement includes a mass flow rate of the material, and further wherein the calibration values include zero calibration values  
25 corresponding to erroneously-detected mass flow measurements of the material during a time of substantially zero flow.

18. The system of claim 15 wherein the operational parameter includes a density  
30 of the material.

19. The system of claim 18 wherein the calibration system is operable to select a current calibration value based on a current density of material in the flowtube, as measured by the measurement system.

5           20. The system of claim 19 wherein the calibration system is operable to select the current calibration value by associating the current density with a pre-selected range of densities that is stored in the memory in association with the current calibration value.

10           21. The system of claim 19 wherein the calibration system is operable to select the current calibration value, based on the current density and a mathematical relationship between the calibration values and their corresponding operational parameters.

15           22. The system of claim 15 wherein the operational parameter includes a configuration of flow elements associated with the flowtube.

          23. The system of claim 22 wherein the calibration system is operable to accept a current configuration input by an operator, and to select a current calibration value based on the current configuration.

20           24. The system of claim 22 wherein the calibration system is operable to select a current calibration value by determining a current configuration based on a currently-measured density that was previously associated with the current configuration.

25           25. The system of claim 15 wherein the operational parameter includes a gas void fraction of flow elements within the flowtube.

          26. The system of claim 25 wherein the calibration system is operable to receive a current gas void fraction from a gas void fraction measurement system, and further operable to select a corresponding current calibration value from the memory.

27. The system of claim 15 wherein the measurement system, the calibration system, and the memory are integrated with the flowmeter.

28. A method of operating a flowmeter comprising:  
5 determining an operational parameter associated with the flowmeter;  
determining a zero-flow calibration value based on the operational parameter, based on a plurality of previously-determined zero-flow calibration values;  
taking a measurement of a property of a material within a flowtube associated with the flowmeter, using the flowmeter; and  
10 adjusting the measurement using the zero-flow calibration value.

29. The method of claim 28 wherein determining the operational parameter includes determining a configuration of flow elements associated with the flowtube.

15 30. The method of claim 29 wherein determining the zero-flow calibration value comprises selecting the zero-flow calibration value from among the previously-determined zero-flow calibration values as being the zero-flow calibration value that corresponds to one of a set of configurations, where each of the set of configurations existed at a time when its corresponding zero-flow calibration value was previously determined.

20 31. The method of claim 29 wherein determining the operational parameter comprises accepting a selection of the configuration from a pre-determined set of configurations.

25 32. The method of claim 29 wherein determining the operational parameter comprises:  
measuring a density of the material; and  
associating the density with a first configuration.

30 33. The method of claim 28 wherein the operational parameter includes a density of the material in the flowtube.

34. The method of claim 33 wherein determining the zero-flow calibration value comprises:

associating the density with a range of densities; and

5 selecting the zero-flow calibration value from among the plurality of previously-determined zero-flow calibration values, based on a pre-determined relationship between the range of densities and the zero-flow calibration value.

35. The method of claim 33 wherein determining the zero-flow calibration value  
10 comprises inputting the density into a mathematical relationship derived from a relationship between the previously-determined zero-flow calibration values and corresponding density measurements.

36. The method of claim 28 wherein determining the zero-flow calibration value  
15 comprises selecting the zero-flow calibration value from among the plurality of previously-determined zero-flow calibration values, based on a pre-determined relationship between the operational parameter and the zero-flow calibration value.

37. The method of claim 28 wherein determining the operational parameter  
20 includes determining a gas void fraction of the material in the flowtube.

38. The method of claim 37 wherein determining the gas void fraction comprises receiving a current gas void fraction from a gas void fraction measurement system, and further wherein determining the zero-flow calibration value comprises selecting a current  
25 zero-flow calibration value previously associated with the current gas void fraction measurement.